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| 09/667,777 | 09/22/2000 | Mitsuaki Komino | 08038.0044 | 1267 |

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| EXAMINER | |
|---|---|
| ZERVIGON, RUDY | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1763 | |

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/667,777 | KOMINO ET AL. | |
| | Examiner | Art Unit | |
| | Rudy Zervigon | 1763 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *05 October 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *6,8-11,16,18-21,23,27,29 and 31-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6,8-11,16,18-21,23,27,29 and 31-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 5, 2004 has been entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 23 recites the limitation "porous ceramic block". There is insufficient antecedent basis for this limitation in the claim.

### *Claim Rejections - 35 USC § 103*

4. the following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 6, 8-11, 16, 19-21, 27, 29, and 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sagusa et al (JP09-165681)[1] in view of Smith; Peter C. (US 5,600,530 A) and Niori; Yusuke et al (US 6,101,969 A).

Sagusa et al (JP09-165681)[2] teaches:

i. a susceptor (Figure 1A,B; Figure 3,4) comprising: A base metal ("aluminum rolled stock 13" [0011]) made of a cast metal – Applicant's specification (page 12, line 37 – page 13, line 2) teaches aluminum as the "cast metal", claim 6, 16

ii. a heater ("sheath heater 11"; [0011] computer translation) arranged in a plane; claim 6, 16

iii. an upper (above) ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) of ceramics" [0012]) arranged above the heater (coil 11; Figure 1B,3); claim 6, 16

iv. wherein the heater ("sheath heater 11"; [0011] computer translation) and the upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) are cast in the base metal ("aluminum rolled stock 13" [0011]) so that the upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) and the heater ("sheath heater 11"; [0011] computer translation) are embedded in the base metal ("aluminum rolled stock 13" [0011]); and wherein the upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) contains a ceramic material ($Al_2O_3$) and a metallic material (Al) composite of the base metal ("aluminum rolled stock 13" [0011]), - claim 6, 16

v. the susceptor according to claim 6, wherein the ceramic material (Al2O3) contained in the upper (above) ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) of ceramics" [0012]) is in a form of a preformed porous block and is infiltrated with the base metal ("aluminum rolled stock 13" [0011]) made of a cast metal – Applicant's specification (page 12, line 37 – page 13, line 2) teaches aluminum as the "cast metal", as claimed by claim 31

vi. the susceptor according to claim 6, further comprising a lower (below) ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) of ceramics" [0012]) arranged below the heater (coil 11; Figure 1B,3) and cast in the base metal ("aluminum rolled stock 13" [0011]) made of a cast metal – Applicant's specification (page 12, line 37 – page 13, line 2) teaches aluminum as the "cast metal", as claimed by claim 32, 34

vii. the plasma processing apparatus according to claim 16, wherein the ceramic material (Al2O3) contained in the upper (above) ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) of ceramics" [0012]) arranged above the heater (coil 11; Figure 1B,3) is in a form of a preformed porous block and is infiltrated with the base metal ("aluminum rolled stock 13" [0011]) made of a cast metal – Applicant's specification (page 12, line 37 – page 13, line 2) teaches aluminum as the "cast metal", as claimed by claim 33

Sagusa does not teach:

viii. a ceramic electrostatic chuck having an upper surface and a lower surface opposite the upper surface (top 13' Figure 4), the upper surface (top 13' Figure 4) being adapted to support an object to be processed thereon; claim 6, 16

ix. wherein Sagusa's upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) has an upper surface (top 13' Figure 4) joined to a lower surface of an electrostatic chuck; claim 6, 16

x. the upper surface (top 13' Figure 4) of Sagusa's upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) is exposed for joining to an lower surface of an electrostatic chuck; claim 6, 16

xi. a mixing ratio between Sagusa's ceramic material ($Al_2O_3$) and Sagusa's metallic material (Al) is determined so that Sagusa's upper ceramic-metal composite (12, "cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]) has a coefficient of linear thermal expansion substantially the same as that of an electrostatic chuck; claim 6, 16

xii. the susceptor according to claim 6, wherein the ceramic electrostatic chuck includes a ceramic base of a ceramic material (Al2O3) and a metallic electrode embedded in the ceramic base and adapted to generate an electrostatic force that attracts the object to be treated, as claimed by claim 27

xiii. the plasma processing apparatus according to claim 16, wherein the ceramic electrostatic chuck includes a ceramic base of a ceramic material (Al2O3) and a metallic electrode embedded in the ceramic base and adapted to generate an electrostatic force that attracts the object to be treated, as claimed by claim 29

Smith teaches a composite electrostatic chuck (Figure 2; column 4; lines 30-69) including:

xiv. a ceramic electrostatic chuck (54; Figure 2; column 4; lines 30-45) having an upper surface (50; Figure 2) and a lower surface (58/54 interface; Figure 2) opposite the upper surface, the upper surface (50; Figure 2) being adapted to support an object to be processed thereon

xv. wherein Smith's upper ceramic-metal composite (58; Figure 2; column 4; lines 30-45) has an upper surface (58/54 interface) joined to a lower surface (58/54 interface) of an electrostatic chuck (54; Figure 2);

xvi. the upper surface (58/54 interface) of Smith's upper ceramic-metal composite (58; Figure 2; column 4; lines 30-45) is exposed for joining to an lower surface (58/54 interface) of an electrostatic chuck (54; Figure 2; column 4; lines 30-45)

xvii. Smith's electrostatic chuck (54; Figure 2; column 4; lines 30-45) and ceramic-metal composite (58; Figure 2; column 4; lines 30-45) are brazed/adhered/welded together (column 4; lines 30-40), - claim 8, 10, 19, 21

xviii. a plasma processing vessels (column 1; lines 58-67; column 3; lines 31-42) – claim 16

Niori teaches a heated ceramic chuck (Figure 4; column 14; lines 45-65). Niori further teaches Niori's susceptor (Figure 4) according to claim 6, wherein Niori's susceptor (Figure 4) is configured so that a high frequency voltage (21-column 15; lines 49-65) is applied thereto. Niori further teaches a metallic electrode (14; Figure 1B) embedded in the ceramic base (130A,B).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to embed Smith's electrostatic chuck to Sagusa's upper, exposed, ceramic-metal composite (12,

"cordierite" (2MgO, 2Al2O3, and 5SiO2), [0012]; Figure 3,4) and optimize the compositions for achieving thermal expansion matching.

Motivation to embed Smith's electrostatic chuck to Sagusa's upper, exposed, ceramic-metal composite and optimize the compositions for achieving thermal expansion matching is for making a heated ceramic chuck that is durable as taught by Sagusa ([0012]), Smith (column 3; lines 1-3), and Niori (column 15; lines 1-16).

6. Claims 23, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano; Shinsuke et al. (US 6,120,661 A) in view of Sagusa et al (JP09-165681)[3]. Hirano teaches a method of making a susceptor (Figure 1A), comprising: placing a heater (15; column 13; lines 53-65) and a first porous ceramic block (12) in a mold (column 13; lines 53-65). Hirano further teaches metal infiltration by immersion of ceramic members to form ceramic-metal composites (column 6, lines 15-32). Hirano further teaches joining (column 14; lines 10-25) a ceramic electrostatic chuck (14; Figure 1B; column 14; lines 10-25) onto a surface of ceramic-metal composite wherein a porosity (column 5; lines 32-51) of the porous ceramic block (12) is predetermined.

Hirano does not teach pouring a molten base metal into a mold to cast Hirano's porous ceramic block (12) and heater (15) in a base metal. Hirano does not teach a porosity of the porous ceramic block (12) is determined so that the ceramic-metal composite has a coefficient of linear thermal expansion substantially the same as that of the electrostatic chuck. Hirano further teaches a second porous ceramic block (130A,B; Figure 1B) is placed in the mold (column 13; lines 53-

65) together with the first porous ceramic block (12) and the heater (15) so that the heater is arranged between the first and second porous ceramic blocks.

Sagusa teaches matching thermal expansions of composite ceramics (12; Figure 1B) bounded by aluminum metal stock (13; [0021]) – "because it approximates with the coefficient of thermal expansion of the heater plate 10".

It would have been obvious to one of ordinary skill in the art at the time the invention was made to pour Sagusa's aluminum base metal into Hirano's mold and optimize the porosity of Hirano's porous ceramic block to match the resulting structure's thermal expansion coefficients as taught by Hirano and Sagusa.

Motivation to pour Sagusa's aluminum base metal into Hirano's mold and optimize the porosity of Hirano's porous ceramic block to match the resulting structure's thermal expansion coefficients as taught by Hirano and Sagusa is for achieving isotropic properties (thermal expansion, thermal conductivity, electric conductivity) among dissimilar composites as taught by Hirano (column 6; lines 5-13).

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sagusa et al (JP09-165681)[4], Smith; Peter C. (US 5,600,530 A), and Niori; Yusuke et al (US 6,101,969 A) in view of McMillin; Brian et al. (US 5,835,334 A). None of Sagusa, Smith, and Niori teach heat

transfer passages. McMillin teaches heat transfer passages (6a; Figure 1) in his electrostatic chuck assembly (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add McMillin's heat transfer passages to Sagusa, Smith, and Niori's electrostatic chuck assembly.

Motivation to add McMillin's heat transfer passages to Sagusa, Smith, and Niori's electrostatic chuck assembly is for managing processing temperatures as taught by McMillin (column 5; lines 14-24).

***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (703) 872-9306. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

12/27/4